No. 47 Oct-Nov 1992

solplan review

the independent journal of energy conservation, building science & construction practice

Inside . . .

Drywall problems are consistently at the top of the list of complaints that builders and warranty programs experience, yet if care and attention is given to proper framing most of the problems can be avoided. Al Koehli presents a few details that show how to avoid common problems.

Recent research on loose fill fibreglass attic insulations has shown that you don't always get what you are paying for - and it's not just the installers fault.We present the findings of the work.

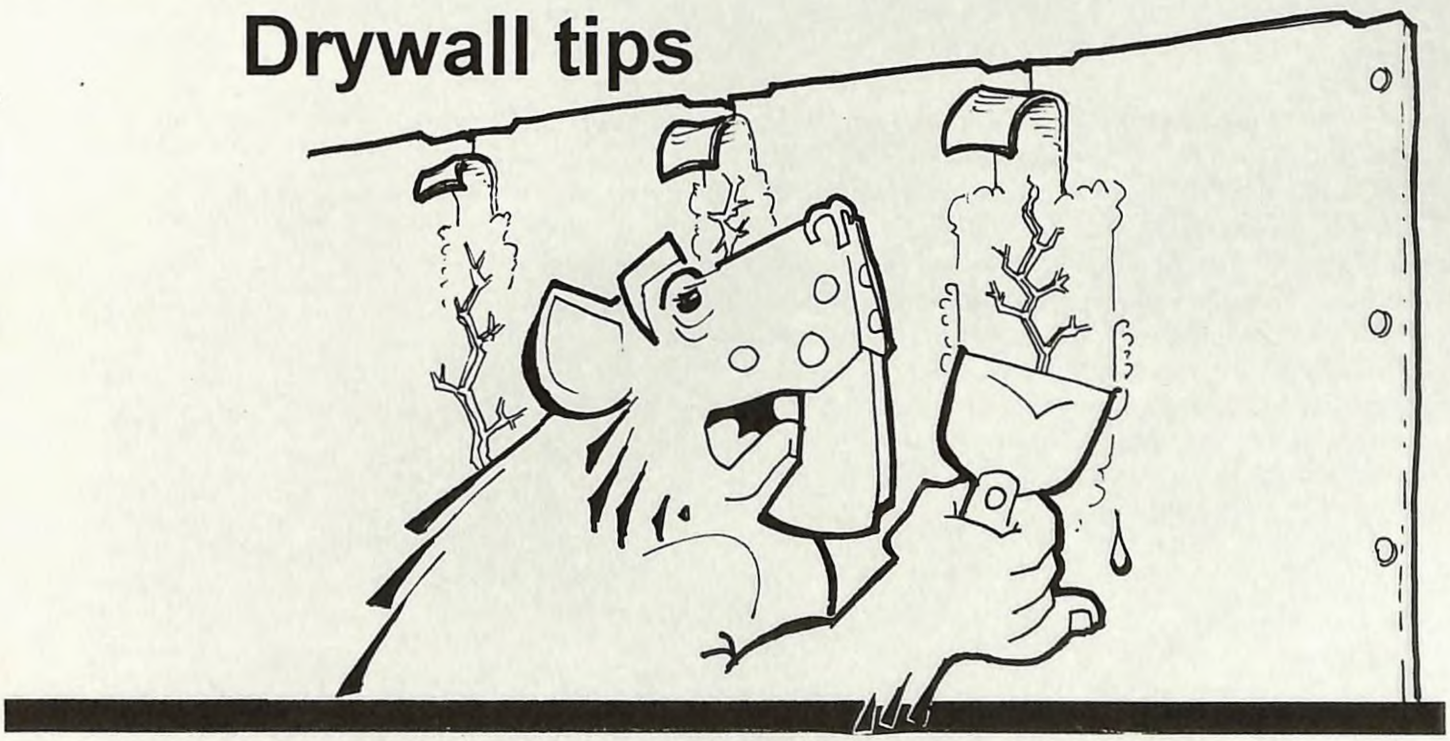
A common approach is to introduce outside air directly to the return air duct of forced warm air heating systems. We report the results of a study to evaluate their performance.

EMR/CANMET News presents updates on the Advanced houses program and a review of the Hamilton Advanced house.

Other items include a discussion of proposed changes to truss design standards and what it could mean to the builder, a product review of a new odour free toilet, TRC news, and more.

Contents . . .

Drywall tips



From the Publisher . . .

Introducing new ideas and educating the general population is a difficult thing to do. I've heard comments made about the difficulty of building energy efficient and "green" homes. There was also a recent story from the medical community about an increase in asthma attributed to new tighter home construction. The mass media ran with headlines blaming it on energy efficient homes, thus reinforcing a myth that energy efficient homes are unhealthy.

In Canada for more than 10 years we've been aware that a *house is a system*, more than the sum of its individual parts. This means that you can't change the way you build a house without influencing something else, so as you tighten the home you have to ensure there is adequate ventilation. This is where building codes - which seem to set the criteria for most construction - are behind developments in technology and practice, so even if minimum code requirements are met there is no guarantee that it is adequate.

The medical study that referred to the tighter houses as a possible cause in respiratory ailments did not investigate the condition of those houses. Were they really tight? What sort of ventilation strategies were used? Was there *any* ventilation provided?

I've heard it said that people may disable or turn off ventilation equipment so why bother insisting on putting in a system? No one seems to question why occupants disable ventilation systems. Could it be that the equipment is noisy, ineffective and creates drafts? How much of the commonly used equipment on the Canadian market will survive past the warranty period of the house if it is run continuously? A properly operating ventilation system will, after all, be silent, effective and operate continuously without any drafts.

Something so transparent may be a difficult concept to sell. The glass industry has had to deal with the issue with their new glazing options - but they are making headway.

The interesting thing is that home owners who've lived with an effective ventilation system for some time appreciate the difference in their environment, especially when something does wrong and the air is no longer fresh. But it takes some education.

We've got to recognize that some of the stories about the unhealthy conditions inside new houses are misinformed comments and nothing more. They underline the lack of understanding of basic principles. Where conditions are unhealthy, they must be recognized as being the result of improper or no systems, rather than something that comes naturally with energy efficiency.

The problem is getting enough people in the building industry (and mechanical sub-trades) to be familiar with good systems, comfortable enough to vigorously sell to their customers.

Richard Kadulski
Publisher

solplan review

Editor-Publisher: Richard Kadulski
Illustrations: Terry Lyster
Contributors: Jeff Rockburn, Steven Thwaites, Ken Manning, Al Koehli, Ross Monsour, John Haysom, David Riley, Doug Geddes
ISSN: 0828-6574
Date of Issue: November 1992
SOLPLAN REVIEW is published 6 times per year by: **the drawing-room graphic services ltd.**
Box 86627, North Vancouver, B.C. V7L 4L2
Tel: 604-689-1841 Fax: 604-689-1841

Street address:
208-1280 Seymour St.
Vancouver, B.C. V6B 3N9
Second Class Mail Registration No. 6855
Postage paid in Vancouver, B.C.

SUBSCRIPTIONS: In Canada 1 year $40.66; 2 years $77.04 (includes GST). USA and other foreign payable in US $ 1 year $46.00, 2 years $88.00.
CHANGE OF ADDRESS: include a mailing label or copy all information off label for faster, accurate processing.
CONTRIBUTIONS: Unsolicited contributions and manuscripts welcome. Include self-addressed prestamped mailer if return requested. Publisher not responsible for loss or damage of same.
While every effort is made to provide accurate and complete information, we do not warrant or guarantee the accuracy and completeness of such information.
ADVERTISING POLICY: Publisher's discretion in the acceptance of any advertisement. No endorsement is stated or implied by the publisher.
PRINTED IN CANADA
GST Registration: R105208805
SOLPLAN is a registered trademark of the Drawing-Room Graphic Services Ltd.

Drywall details:

How to avoid some of the most common drywall problems

by Al Koehli

The element that generates the most complaints for New Home Warranty Programs is drywall, followed by squeaky floors. Both of these are caused by wood shrinkage. Are we doomed to suffer drywall problems as long as we build with wood framing? What can be done to prevent these complaints?

Most problems are caused by poor framing; the rest by drywall installers. In order to avoid problems the framing must be nailed in a way that will prevent the wood from twisting or cupping. A few simple framing practices will improve your product.

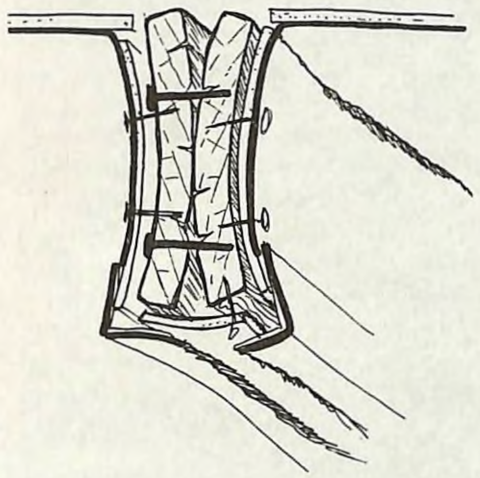


Fig. 1 When drywall is nailed to a laminated wood drop beam that has not been nailed properly, as the wood warps and cups when it dries, stresses will rip apart the drywall.

In general, the drywaller can prevent these problems by

- using glue on corner beads,
- use floating corners
- only fasten to the centre piece of laminated lumber
- float drywall sheets at the stair well to the centre of the stair joist

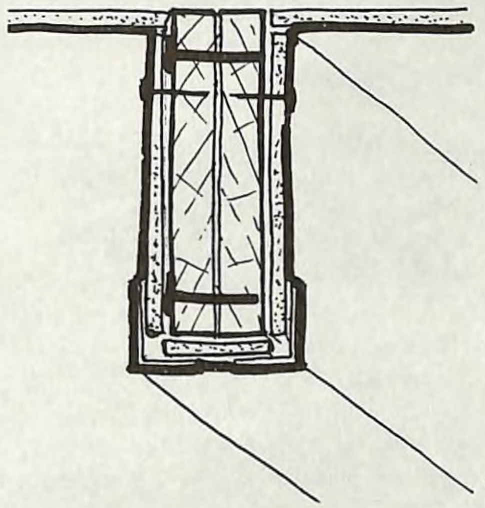


Fig. 2 Use a floating corner at drop beams, nail drywall with a small headed nail in the upper half of the beam only (and ensure the beam is properly nailed together).

Proper nailing of any laminated lumber is important to prevent twisting while drying. As wood dries from the outside in, it causes the wood to cup, which pops the corner beads or nails. There are very few nail pops when finger jointed studs (or kiln dried materials) are used because the wood is dryer. With finger jointed material the fibres are oriented differently in each piece of wood; this keeps the studs from twisting. Non structural wood pieces tend to twist even more.

When lumber is laminated, only fasten the drywall to one of the pieces, the one which is closest to the middle.

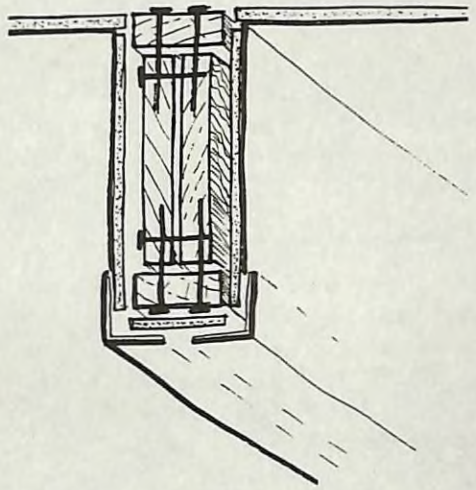


Fig. 3 The best way to prevent drywall problems on a drop beam is to make the corners float. Use small headed nail (tape & fill over) and glue on the corner beads. A plywood or wood block at bottom of beam also helps prevent wood members from twisting or warping.

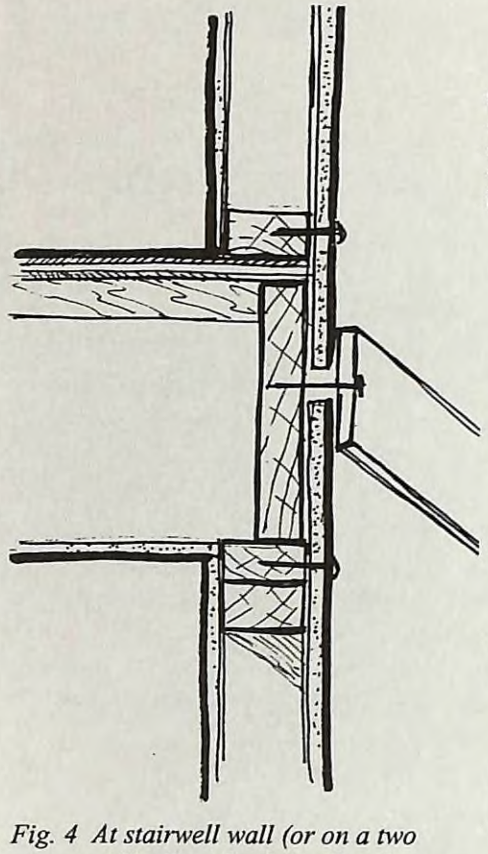


Fig. 4 At stairwell wall (or on a two storey wall) allow the drywall to float at the joint. The gap between sheets must be free of filler, don't nail drywall into the floor joist/header, and don't nail the cover strip into the drywall.

Never fasten drywall to backing when it is held in place by another drywall board, as these backing boards will always twist or cup thus making drywall cracks more likely.

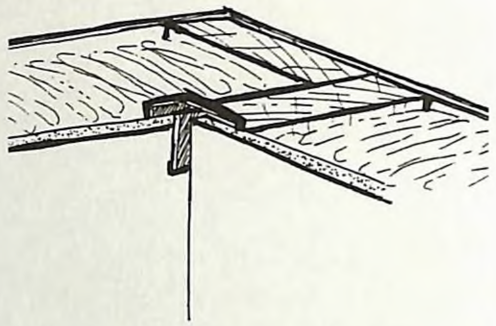


Fig. 5 On corners use a two stud framing detail and attach second drywall sheet with drywall clips to allow the drywall to float. This allows the drywall to float, so that stresses can't pull apart the drywall and cause cracking of the filler.

When boarding at a stair well extend the sheet below the floor level or above the ceiling line and let it float to the centre of the floor framing.

Use headers that will have the least possible shrinkage. Cripples should be framed a little longer to make sure that when the header shrinks it will drop as little as possible.

Al Koehli is a practical housing consultant based in White Rock. A retired builder, he has many years of experience with wood frame construction as well as many years of activity in the housing industry.

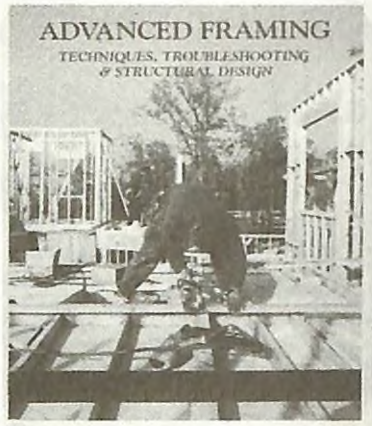
Rigid Insulation Board

Rigid insulation for below grade applications, must be capable of resisting loads applied and be resistant to moisture penetration (labelled as type II). Up to now the most commonly used rigid board insulations have been the closed cell extruded polytryrenes.

Beaver Plastics of Edmonton has developed TerraFoam, a high density expanded polystyrene insulation specifically designed for below grade and under-slab applications. As with other expanded polystyrene insulation boards, the blowing agent is steam. It is manufactured in 2'x8' panels, plain edged or shiplapped, and is available in R5, R7.5 and R10 values.

With an R value of 4 per inch, the R 5 panel is 1 1/4" thick

For information:
Beaver Plastics Ltd.
12150 - 160 St.
Edmonton, AB T5V 1H5
Tel (403) 453-5961
FAX (403) 453-3955



Advanced Framing: Techniques, Troubleshooting & Structural Design

46 feature articles that first appeared in The *Journal of Light Construction* have been gathered into this practical handbook. The articles were written by hands-on experts with years of field experience. Each offers practical step-by-step solutions to common problems. The topics covered - whether energy details for cathedral ceilings or shoring sagging beams - emphasize the techniques to get the job done quickly without compromising the quality of construction.

The book has 12 sections, including Floor Systems, Wall systems, Roofs, Remodellers' Specialties, Troubleshooting, Trusses, Engineered Lumber, Panelized Systems, Pole and Timber Construction, Building with Steel, and Energy Design. An introductory section is devoted to tool selection, site set-up, and wood basics. Within each section, sharply focused chapters give in-depth coverage of specific construction issues.

250 photos, clearly rendered illustrations, and precise drawings accompany the articles to make the details crystal clear. A no-nonsense reference book for the professional builder.

US $24.95 From:
The Journal of Light Construction
RR #2 Box 146
Richmond, VT 05477

Attic Insulation: does it measure up?

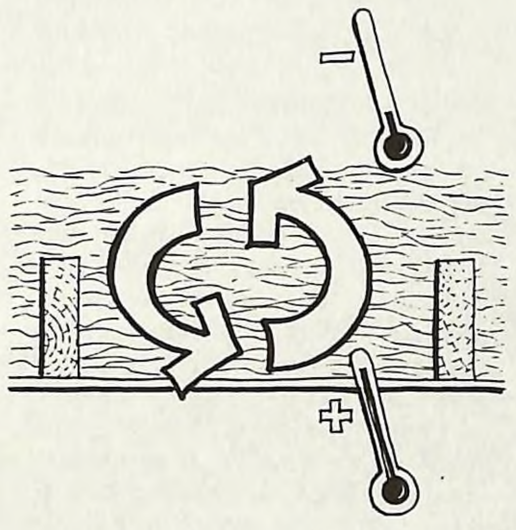
New research on loose fill fibreglass insulations

Does insulation always work the way it's supposed to? Test results show that during cold winter days some insulation could be providing only half the protection promised by manufacturers.

Recent laboratory tests have confirmed that the insulation progressively loses its effectiveness when temperatures drop below 0°C. The tests show the insulation can lose up to 50% of its R-value as temperatures drop to -23°C or lower. Attic insulation rated at R38 often performs at R19 or less in extremely cold weather.

Tests were done at the Oak Ridge National Laboratory's Large Scale Climate Simulator in Tennessee. They were done with loose fill fibreglass insulation, with and without ventilation in the attic space. The ventilation of the attic space doesn't seem to alter the thermal resistance of the insulation. The problem is primarily one of low-density "loose fill" fibreglass insulation, which are a common product installed in of new homes.

The loss of insulating value is attributed to convection through the insulation as the temperature drops. The heat transfer rate by natural convection is not proportional to the temperature difference across the insulation, but increases faster than the temperature difference, and the thermal resistance decreases with increasing temperature difference. Other insulation materials, such as mineral wool and cellulose insulation are denser and have different properties, so that their performance does not decrease as quickly as for fibreglass.



The big variation between advertised R-values and those actually obtained in winter conditions arises from a shortcoming in the standard ASTM test procedure which is done at quite warm temperatures. The test is done under steady state conditions with restricted convection and at 21°C, rather than the cold, draughty conditions in an attic during winter.

The insulating properties of fibreglass insulation has traditionally been considered to arise from the entrapment of still air in the insulation. Heat transfer through the insulation would then be a combination of conduction through still air, conduction through the glass fibres and radiative transfer through an absorbing, scattering, and emitting medium. However, heat flow by circulation of air through the insulation by natural convection happens under certain conditions when the attic is colder than the space below the ceiling. Cold dense air in the attic falls into the insulation, where it is warmed, becomes less dense and then rises back up into the air space carrying additional heat with it.

This could be a technical and academic debate only, except that the State of Minnesota has published new regulations to deal with the problem of lower effective insulation R-values as temperature drops. (As early as 1983 the industry has known that there can be a loss of effectiveness in the winter). It is the first

Loose Fill Fiberglass Insulation R-values

Interior temperature	Exterior temperature	RSI	R-value
21 °C	7 °C	2.99	17
21 °C	0 °C	3.12	17.7
21 °C	-7 °C	2.87	16.3
21 °C	-13 °C	2.52	14.3
21 °C	-20 °C	2.14	12.2

regulation that requires the product to perform as advertised in cold weather. The Minnesota Building Code now states: "*All thermal insulation must achieve no less than stated performance at winter design conditions.*" Manufacturers have challenged the action, but a judge ruled that the standard was reasonable.

To comply with the new standard, the insulation industry has to develop new testing procedures and will have to label the product according to its effectiveness during cold weather. Builders and contractors will either have to install more loose fill fibreglass insulation or use other types of attic insulation that are not subject to this much decrease in performance.

So what?

How significant is it that the R-value drops during the coldest period? Due to variables such as different home designs and weather conditions, and different occupancy habits, it is difficult to calculate a cost impact. Minnesota estimates the cost to a home owner of the lower performance of loose fill fibreglass insulation could be about $20 a year; in colder climates, as on the Canadian prairies, it could be more. In true American fashion, a class action law suit has already been launched in Minnesota against several manufacturers.

"Attic Testing at the Roof Research Center" by K.E. Wilkes, R.L. Wendt, A. Delman, and P.W. Childs of the Roof Research Centre, Oak Ridge National Laboratory, Oak Ridge, Tenn. published in the proceedings of the 1991 International Symposium on Roofing Technology, Rosemont, Ill.

Hard Ducted Make-up Air for Ventilation

Doug Geddes

The 1990 National Building Code (and 1990 Ontario Building Code) requires a mechanical ventilation system capable of providing at least 0.3 air changes per hour (ACH) in every home. In addition, if spillage susceptible combustion appliances are installed in the house, provisions for make-up air must be installed to ensure that depressurization levels do not exceed 5 Pa.

The simplest way of complying with the 1990 ventilation requirements is to install bathroom and kitchen fans with enough ventilation capacity and a passive duct (usually in the basement) big enough not to cause excessive depressurization. While this "minimum" design is a simple concept, it is becoming clear that for most houses with even modest exhaust fan capacity, the passive intake will have to be very large to satisfy the depressurization limits for the house. Unfortunately, homeowners block off these passive ducts when the drafts get uncomfortable.

An alternative approach is to draw fresh air from outside through a duct connected directly to the return air in forced warm air heating systems. There have been concerns about cool drafts and that furnace heat exchangers may rust due to condensation when fresh air ducts are connected to the return air.

The energy impact of this type of ventilation system and the practicality of installing high inside wall supply outlets was also not known. To get answers to these concerns, test houses to measure air flows, temperatures and pressures during various modes of system operation were found in B.C., South Western Ontario, and in Edmonton, Alberta.

The Heat Exchanger concern

No signs of corrosion in the heat exchanger could be linked to condensation resulting from cool ventilation air in the Alberta, B.C. and Ontario houses inspected. Unfortunately, only one system was run continuously (the worst case scenario), as most operated only when the furnace came on. Even if most of the systems examined in Alberta (the coldest area) had been running continuously, measurements of the fresh air flow rate and calculations of the mixed air temperature in the return air ducts at outdoor design conditions showed that flow rates were not high enough to cause the temperature to fall below the dew point (about 13°C). This was largely because the ventilation flow rates were much less than that required by the Building Code.

How do home owners feel?

The owners of all of the houses inspected were surveyed to determine their awareness of the ventilation system, their perspective of its performance and how they operated the system.

Most of those surveyed knew their house had a fresh air ventilation system, probably because most of those in B.C. and Alberta worked for the utility.

Most of the Ontario homeowners knew they had a fresh air ventilation system because they either had the system added to correct a moisture problem, or as was the case of some townhouses with the high ventilation rates, the owners were experiencing high utility bills. The few systems that had a manual control were seldom activated by the owners, probably because most of them would have been required to open the furnace cabinet to activate the fan switch.

The Ontario home owners did not have much understanding of the purpose of fresh air ventilation or how the system works. With the exception of B.C. home owners, most felt that their house was too dry in winter - some had added humidifiers as a result. This often is an indication of ventilation levels that are too high. Few comfort complaints were received, possibly because most of the systems only operate when the furnace is producing heat.

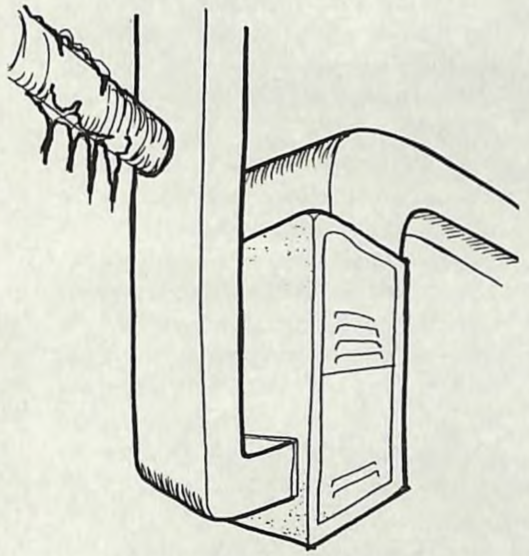
Air Supply: High Inside Wall Supply Outlets

Standard forced warm air systems supply air through registers at the floor. Good design practice calls for the air temperature in floor diffusers to be above 18°C. In most parts of the country if incoming fresh air is not tempered by a duct heater or a heat recovery ventilator, the mixed air temperature in the distribution system will be below 18°C during the coldest part of the heating season. However, in a properly built house there is no reason why the supply has to be at the floor.

Supply outlets located high on an inside wall can introduce air as cool as 13°C into a space without causing comfort problems, compared to 18°C for normal floor diffusers. It also reduces the amount of tempering of the fresh air during cold weather.

High inside wall outlets have a higher initial cost, (an Edmonton contractor estimated the additional cost to be $50 to $52 per run, an Ontario contractor $40 to $65.) but they can reduce the operating cost of the ventilating system.

A typical 187 m^2 (2012 sq.ft.) house would need about 10 high inside wall outlets for a total additional cost (over floor registers) of $500. Calculations show that if the ventilation air for that house, located in Toronto, had to be tempered electrically to keep the temperature of the mixed air in the return air above 18°C, the tempering cost at today's rates would be $218 annually (by natural gas $97). The cost to electrically temper the air to 13°C for high inside wall outlets it would only be $26 annually (by natural gas $12).



These calculations assume a continuous ventilation rate equivalent to 1/3 ACH. Since this cooler supply air still has to be heated, the annual cost for natural gas would be about $84 so the total savings for the home owner using high wall outlets would be about $110. This is a six year payback for the additional cost of the ten outlets.

Of course an HRV could be used to temper the fresh air to 13°C, rather than an electric duct heater, for even greater annual operating savings, but the payback period would be much longer because of the higher initial HRV cost (approximately $1300 installed) compared to that of a duct heater ($400 installed).

Where is the Best Place to Connect the Fresh Air Duct?

Where to connect the fresh air duct to the return air system has been a concern that can be resolved by a process of elimination.

It may seem that there may be an advantage in having this connection as far upstream from the furnace as possible, as the further from the furnace, the more mixing of cold and warm air could occur. This would allow duct heat gain to temper the air before it reaches the furnace heat exchanger, but this option is not practical. It is difficult to calculate the amount of tempering that may occur and the resulting air temperature at the furnace. A portion of the return air duct could be exposed to temperatures lower than 13°C so it would have to be insulated and sealed with a vapour barrier.

The connection must be downstream of all other return air branch connections. The best location is immediately downstream of the last branch connection to the return air trunk duct. Ideally this should be within one foot downstream to take advantage of the turbulence caused by the upstream connection which will enhance the mixing of cold fresh air with the recirculating indoor air.

None of the ventilation air ducts located in the Ontario houses were insulated for their full length and those with partial insulation had no vapour barrier over the insulation. The lack of continuous insulation and vapour barrier in these homes is an indication that the installing contractors had little or no understanding of basic principles and ventilation systems.

When a supply only ventilation system is combined with a combustion air supply and/or an open chimney, the chimney and/or combustion air supply will also act as a pressure relief and exhaust air. It seems that when a supply-only

system is installed it may not be necessary to provide any additional combustion air because the supply becomes an exhaust as a result of house pressurization. When the furnace blower comes on, the house pressurizes and any spillage occurring should stop.

It was noted that none of the systems examined were designed in accordance with new NBC requirements or HRAI design procedures.

Despite the extensive training sessions provided to contractors by HRAI, a visit to many houses being built in accordance with the new Ontario Building Code indicates that some designers and installers have little or no understanding of basic physics, air movement or ventilation. Better and more practical training courses delivered by knowledgeable trainers may help.

Duct system configurations and designs used since the early 1950's have reached the point where they have to be reviewed and consideration be given to making them more efficient, so less blower energy should be required to move air. There is no prescriptive requirement for efficient duct fittings.

Return air systems are the weak link in most forced air systems, being affected to a much greater effect by turbulence caused by branch connections. Turbulence may be a useful tool in some situations.

Test House Results

A house in Edmonton was used to complete a number of tests relating to the performance of the combined heating/ventilating system. The following was learned from the tests conducted:

- Both the ventilation and combustion air duct act as make-up air ducts when the furnace blower is not operating;
- The make-up air flowing in through the ventilation duct travels into the heating system return air duct and moves towards the furnace where it pools because the furnace acts as a large "P" trap;
- When the outdoor temperature is below 0°C, the temperature of this air in the return duct and in the furnace can fall below the dew point, possibly leading to condensation on the ducts and the furnace as well as the flue gases of a standing pilot light, if present;
- When the furnace blower operates at a rate sufficient to bring in enough outdoor air for 1/3 ACH, it will slightly pressurize a tight house (3.3 Pa);
- When the furnace blower operates, the house pressurizes and the combustion air duct exhausts indoor air to the outdoors;
- When such exhausting occurs, it can lead to short circuiting with the ventilation air inlet, if the ventilation air inlet is located close to the combustion air inlet;
- When an open vent or chimney is present, it also exhausts air reducing the amount of air being exhausted by the combustion air duct; and
- Operation of the furnace blower induces enough fresh air flow into the house to help compensate for air being exhausted by exhaust devices, reducing the possibility of combustion product spillage and/or the duration of such spillage.

from "Evaluation of the Effectiveness of A Hard Connected Duct Into The Return Air System of a Furnace Forced Air Duct System as a Means of Providing Ventilation and Make-up Air by Douglas" Geddes for CMHC.

Letters to the Editor

Sir,

Your story on Willmar's R-12 window was interesting and a typical example of how SOLPLAN REVIEW continues to be the source of real news for building professionals.

Your story is also an example of our infatuation with the centre glass R-values of windows. Centre glass R-values are not the best way to compare the thermal performance of windows. There are at least two reasons we should be cautious when discussing centre glass R-values.

Firstly, as you point out in the article the effort of frames and spacers dilutes the centre glass R-value. In this case by more than half, from R-12 to R-5.3. The amount of dilution will vary with the frame and spacer materials.

The amount of this dilution will also vary with the ratio of frame area to glass area. This is why a single 4'x4' window is more energy efficient than two 2'x4' windows. Similarly, a fixed window is more energy efficient if it's made without a sash (a "picture window" instead of a "fixed casement").

Secondly, R-values, centre glass or otherwise, tell us nothing about the transparency of a window. A high R-value window is great, but if it blocks most of the useful solar gains it might as well be a wall.

The Energy Rating (ER) is a much more useful way to compare energy performance. ER accounts for all the losses (glass, frame and air leakage) as well as the solar gains over a heating season. Ontario Hydro uses the ER to decide which windows qualify for their $5.00/sq.ft. rebate. A close examination of the list of eligible windows shows the difference between the centre glass R-value and the ER.

One aluminum clad wood casement is listed with both R-8 glass (Quadruple glazed, 2 Heat Mirror™ films, krypton &

SUBSCRIBE TODAY!

SOLPLAN REVIEW is an independent Canadian Journal published 6 times per year to provide news, technical details, new product information, insights and commentary on developments covering all aspects of building science and energy efficient building practice for new and retrofit residential construction.

SOLPLAN REVIEW serves the needs of professionals and interested lay persons. Technical information is presented in a clear, concise manner, without resorting to jargon. As an independent subscription supported publication, we rely on the support of our readers. If you are seeing this journal for the first time, and find it valuable, why not ensure you don't miss any copies. Subscribe today!

YES, I WANT TO SUBSCRIBE TO **SOLPLAN REVIEW**

In Canada:
1 year: $40.66 ($38.00 + 2.66 GST) 2 years: 77.04 ($72.00 + 4.76 GST)
USA and other foreign: (in US funds)
1 year $46.00 per year 2 years:$ 88.00

payment enclosed please bill us P.O. # ______

Carge to credit card:
VISA MASTERCARD AMERICAN EXPRESS

Card Number: ____________ Exp. date: ______

Signature ____________

Name: ____________

Address: ____________

____

Post code: ____________

the drawing-room graphics services ltd.
box 86627 north vancouver, b.c. v7l 4l2

THE BOOKSHELF

A selection of books that will be of interest to our readers. Price and availability subject to change without notice.
All orders shipped by bookpost. Please add $0.85 per book for postage and handling ($3.00 max. per order);
outside Canada: $1.75 per book ($6.00 max. per order).
CANADIAN ORDERS PLEASE DON'T FORGET TO ADD 7% GST

REVIVING OLD HOUSES by Alan Dan Orme. Over 500 Low-Cost Tips & Techniques for renovating older homes. $13.50

FLOWER GARDEN PROBLEM SOLVER by Jeff and Liz Ball. An excellent gardening reference for selecting, propagating, caring for and enjoying your garden without chemicals. $ 33.95

RODALE'S CHEMICAL-FREE YARD & GARDEN An expert guide to chemical free gardening. Includes many proven natural remedies to common gardening problems, including insect, disease and weed control. $ 32.95

NONTOXIC, NATURAL, & EARTHWISE by Debra Lynn Dadd A reference manual on how to identify products that are safe and non-toxic. Contains a list of healthful products on the market, how to rate products, and suggestions for non-toxic home-made alternatives. $17.95

YOUR HOME, YOUR HEALTH, AND WELL BEING

by David Rousseau, W.J. Rea, Jean Enwright. What you can do to design or renovate your house or apartment to be free of outdoor and indoor pollution. By knowing what pollutants affect our homes, and applying carefully explained step-by-step solution, dwelling can be transformed into healthy, quiet clean pleasant places. A special detailed section gives recommendations for those with environmental sensitive $19.95

THE COMPACT HOUSE BOOK: 33 Prize Winning Designs - 1,000 sq.ft. or Less
Don Metz, editor; The designs presented were winners of a Garden Way Compact House Design Competition. Shows a range of designs stressing low energy, modest cost, & how small houses can be imaginative & comfortable living spaces $19.95

THE TIMBER FRAME HOME Design, Construction, Finishing. by Ted Benson
The age old craft of timber framing has gained new life in recent years. This illustrated book covers the fundamentals of the craft and the range of design and structural options available. $24.95

Rodale's Book of PRACTICAL FORMULAS Easy to make, easy to use recipes for hundreds of everyday activities and tasks. Health, gardening, home repair, housekeeping, outdoor life, beauty & car care. Natural alternatives to toxic products; be friendly to the environment. $32.99

HOME AUTOMATION SYSTEMS: AN OVERVIEW FOR CANADA. Prepared by the Canadian Automated Buildings Assoc. Easy to follow overview of what's available now or will be soon. $50.00

NEW COMPACT HOUSE DESIGNS: 27 AWARD WINNING PLANS 1250 sq.ft. or less. Results of the follow up to the successful competition that was published as The Compact House Book. $22.95

THE VISUAL HANDBOOK OF BUILDING AND REMODELLING by Charlie Wing A illustrated reference to building materials and systems; formulas to estimate coverage, buying supplies, pricing, etc. $27.95

WARM HOUSE, COOL HOUSE. A guide to energy use in your home, by the editors of Consumer Reports, $22.99

THE HOME WATER SUPPLY How to Find, Filter, Store & Conserve It by Stu Campbell A handy reference for those looking to install or manage an independent water system. $ 22.95

FIGHT GLOBAL WARMING: 29 Things You Can Do by Sarah L. Clark, Environmental Defence Fund. Concerned about the state of the environment but not sure where to start? This little handbook gives oyu a number of places to start. $9.95

CHEMICAL ALLERGIES Hidden Chemical threats to your health in Food and House hold products by Dr. Richard Mackarness $ 9.95

FOR THE JUNIOR SET: RADS, ERGS AND CHEESEBURGERS: the Kid's Guide to Energy and the Environment by Bill Yanda A kid's eye-view of energy consumption and its environmental implications. An informative and entertaining book. For ages 8 and older. $ 16.95

Please circle items you wish to order. Total $__________

Please charge to credit card:
VISA AMERICAN EXPRESS MASTERCARD

Card No. / expiry ____________________ ________

signature ____________________

NAME: ____________________

ADDRESS: ____________________

____________________ POST CODE____________

the drawing-room graphics services ltd.
box 86627 north vancouver, b.c. V7L 4L2

Thermal Performance of the Exterior Envelopes of Buildings . . . Building Thermal Envelopes V Dec. 7-10, 1992 Clearwater Florida. Information Tel: (615) 574-4345, Fax (615) 574-9338.

Building Solutions Conference: Uniting Excellence & Innovation, 1993 Energy Efficient Building Assoc. conference, March 3-6, 1993, Boston MA. For information: William Lemke, EEBA Headquarters, 1000 Campus Dr. Wausau, WI 54401 Tel: (715) 675-63331, Fax (715) 675-9776

Advanced Housing of the World '93 The major international technical conference on building technology, products and systems.
June 20-26, 1993, Vancouver, B.C.
For information:
CANMET, Energy Mines & Resources Canada, 7th Floor, 580 Booth St., Ottawa, Ont. K1A 0E6
Tel: 613-943-2259 FAX 613-996-9416

SESCI '93 Solar In Action: 19th Annual Meeting of the Solar Energy Society of Canada Inc. July 9-13, 1993 Quebec City, Que. Call for Papers & for more information, contact: SESCI, 420-301 Moodie Dr., Ottawa, Ont. K2H 9C4 Tel: 613-596-1067 (FAX 613-596-1120)

BACK ISSUES SPECIAL
We still have some back issues of SOLPLAN REVIEW. Individual copies of back issues are available for $4.00 each, post paid.

the drawing-room graphic services ltd.
box 86627 north vancouver, b.c. V7L 4L2

Hurricane Andrew Aftermath

In the midst of tragedy one can make interesting observations and learn from them. When mother nature unleashed the fury of Hurricane Andrew on Florida it tested all man-made structures. We've seen photos of the devastation - whole communities levelled.

In Homestead, Florida a group of houses was left standing, while all around them everything was destroyed. The four houses were built by the Habitat for Humanity Foundation, a group sponsored by former USA President Carter, that helps provide housing for the low income and homeless. When volunteers with the Foundation were questioned by the media about what the secret was, they replied that they were "just built to code - we built them right". Poor families now continue to live in their undisturbed homes, while the rest of Homestead blew away.

Didn't anybody else follow the rules?

thermally broken spacer) and R-4 glass (double glazed, Low E, argon & Superspacer™). They both have an ER of -11!

The differences in frame construction also show up in an ER comparison. Another window, a fibreglass casement, with R-3.3 glass (Double glazed, hard coat Low E, argon & Superspacer) has an ER of 1. The best window on the list is an R-6.2 fixed window, also made from fibreglass, has an ER of 17!

So although it's tempting to get infatuated with the centre glass R-value, it is much more informative to compare the ER value.

Stephen Thwaites P. Eng.
Thermotech Windows Ltd.
Ottawa, Ont.

Sir,

I am writing to applaud your efforts (Technical Research Committee report SOLPLAN REVIEW, August-September 1992), to encourage builders to get involved in helping to shape the proposed new energy code.

One of my roles in the Canadian Codes Centre is to act a Technical Advisor to the Standing Committee on Energy Conservation in Buildings, the subcommittee of the Canadian Commission on Building and Fire Codes responsible for the development and maintenance of the Canadian Code for Energy Efficiency in New Houses. I can assure you that the Standing Committee welcomes the constructive input of builders and we agree with you that the provincial and national TRC's provide a logical conduit for that input.

We do find somewhat unfortunate that your reporting of some of the issues that the Standing Committee is addressing is not totally accurate (e.g. it is NOT proposed to require airtightness testing of all houses) and is stated in fairly incendiary language. However, we won't complain too loudly if that approach is successful in drawing builders' attention to the fact that an energy code is being developed which may be adopted by many provinces and that they need to get involved if they wish to ensure that the final result is a code the building industry can live with.

I do want to assure your readers, however, that the draft of the Code you have seen and on which your report is presumably based is very preliminary and will undergo several revisions before being released for public review next summer. In view of the input already being received from CHBA and from builder members of both the Standing Committee on Energy Conservation in Buildings and the Standing Committee on Housing and Small Buildings (the committee responsible for Part 9 of the NBC), it is unlikely that some of the "worst case scenarios" described in your report will appear in the final version. Nevertheless, additional input is always welcome and we appreciate your efforts to generate it.

I hope that we can count on your further assistance in letting the industry know when the energy code and changes to the National Building Code are available for public review next year.

John C Haysom, P.Eng
Unit Head, Buildings and Services
Canadian Codes Centre
Ottawa, Ont.

Sir,

I enjoyed your recent item on the Builder's Ten Commandments (SOLPLAN REVIEW Aug-Sept 1992). It seemed hard on Sub-trades, especially those who choose to work for homeowners (which obviously can be easier or more difficult depending on the circumstances), so they might more likely be seen as the Ten Commandments of the Sub-trades. For the sake of balance (I have worked as both, for homeowners and contractors), herewith my Ten Commandments of the General Contractor.

1. We are not simple builders, we are construction project managers
(we don't know a 2x4 from a vacuum relief valve, but we certainly can spit out a pretty looking flow chart)
2. Sub Contractors should be best left to their own devices
(we can't improve their performance or quality because we really don't know what they do)
3. No one uses material of your choice anymore.
(We don't because it's not the cheapest)
4. You can't buy material of your choice any more.
(We are the low bidder and we are not buying it)
5. If our sub trades screw up, we don't pay them
(but you might have to)
6. R-2000 houses are dangerous and ventilation, smentilation, what's wrong with windows?
(we are not interested in building science and you want the cheapest job, don't you?)
7. Our sub trades stand by their work
(call them, not us)
8. This house will be quality throughout
(it will meet the minimum requirements of the building code).
9. All our sub trades use seasoned certified professionals
(well, some may be 20 and have a drivers licence)
10. Yes, we are the low bidder and will be using the cheapest trades, but you are protected by our excellent specs and power of payment
(our own quality control is the overworked building inspector)

David Riley
Circa Homes Ltd.
White Rock, B.C.

Residential Roof Truss Design at a Crossroads

By John Haysom

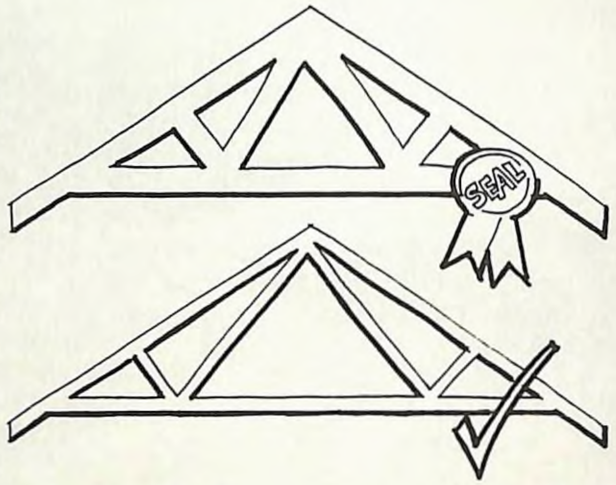
There are two principal ways of building house roofs: rafters and joists, and roof trusses.

The rafter-and-joist approach is the traditional method and is still used for roofs with unusual configurations. However, since their introduction in the 1960s, prefabricated trusses have gradually taken over the bulk of the market.

Many in the housing industry are unaware that provisions introduced into the 1960 National Building Code (NBC), by permitting residential roof trusses to be lighter than trusses for other types of buildings, have played a major role in bringing this about and, in the process, have saved the housing industry hundreds of thousands of dollars per year.

Proposed changes to wood design procedures mean the way roof trusses are considered in Part 9 of the NBC have to be reexamined. Staff at the Canadian Codes Centre of the National Research Council's Institute for Research in Construction (IRC) are working with the truss industry to ensure that the benefits of light residential trusses are not lost in the shuffle.

When prefabricated roof trusses were first explored in the early sixties, it was found that trusses designed according to normal wood design codes required much larger members than the rafters and joists they were supposed to replace, while structural theory says that truss chords should be lighter than rafters and joists for any given span. While the rafter and joist tables in the NBC would not satisfy standard wood design procedures as set out in CSA Standard 086 "Engineering Design in Wood," they have been developed from many years of experience and have proven to be satisfactory.



In order to put trusses on an equal basis with conventional framing, the Division of Building Research (now IRC) did extensive tests on conventionally framed roofs to determine what loads these roofs could sustain. The tests showed performance varied widely, with the worst not even supporting their nominal design load.

One result was that the roof-framing requirements in the NBC were rewritten to eliminate the worst types of conventional framing. Another result was that a testing procedure for trusses was written which required that trusses have strength equal to the better forms of conventional framing.

This meant residential Wood trusses did not have to meet CSA Standard 086 "Engineering Design in Wood." It was only necessary that they be able to pass a test-described in CSA Standard S307 "Load Test Procedure for Wood Roof Trusses for Houses and Small Buildings." That remains the situation in the current NBC.

In the early days many designs were tested, but as the industry and building officials became more comfortable with trusses, fewer and fewer were tested. Eventually a design procedure was developed for residential trusses which the industry could be confident would pass the test.

This procedure is the same as used to design normal trusses except that allowable stresses are increased by 33%. (CSA 086 permits allowable stresses to be increased by 33% for structures supporting loads which only last 24 hours). Since CSA S307 calls for the test to last 24 hours, it all seems to tie together. This is something of an illusion, though, since the actual loads that the trusses must support in service can last for months and design in strict accordance with CSA 086 would not use the 33% factor.

Nevertheless, this apparent correlation between the 33% higher stresses the industry uses to design residential trusses and the 24-hour load-duration factor in CSA 086 has allowed the industry to avoid a lot of unnecessary testing over the years when its designs have been challenged by building officials or, sometimes, by engineers who observe that trusses designed under Part 9 (Housing and Small Buildings) of the National Building Code do not necessarily meet the requirements of Part 4 (Structural Design).

There is nothing wrong with this of course. It should be made clear that the provisions of Article 9.23.13.11 of the NBC are based on the specific intention that residential roof trusses need not be as heavy as those designed in accordance with CSA 086 (which is referenced in Part 4 - Structural Design - of the NBC). Nor is it intended that all truss designs be tested. The wording in Sentence 9.23.13.11 (8) is intended to convey the notion that the truss need only be capable of passing the test and that the test need only be done where doubt exists.

All this is somewhat obscure, and occasionally building officials or consulting engineers have called in to check a design have trouble accepting those that do not comply with CSA 086. This is where the "crutch" of the 24-hour load-duration factor has been handy.

But things are going to change. In 1995, the 33% loading duration factor is going to disappear from a rewritten CSA 086, as the working-stress approach to design is abandoned in favour of limit-states design. The revised standard will mean that designers won't have the crutch that the 33% factor has provided.

As the change approaches, staff at the Canadian Codes Centre are working with the Truss Plate Institute of Canada (TPIC) and the Canadian Wood Council (CWC) to identify new approaches to truss design so that truss-design practices can maintain the economy of the proven and reliable light residential truss without having to rely on "crutches." TPIC is planning a major research project and CWC is exploring the effects of the limit-states version of CSA 086 on normal truss designs. Recent discussions indicate that TPIC, CWC, the Standing Committee on Housing and Small Buildings (the committee responsible for Part 9 of the NBC) and the Canadian Home Builders' Association all agree there is no need for any increase in the size of lumber used in residential roof trusses. The challenge is to avoid such change while remaining within the framework of changing design standards.

John Haysom is Unit Head, Buildings and Services, at the Canadian Codes Centre of the Institute for Research in Construction, National Research Council of Canada. The Centre coordinates the activities of volunteer committees that revise the national code documents in a five-year cycle, edits and publishes the codes, and works with the provinces and territories to encourage consistency in regulation across the country.

Ventex Odour Free Toilets

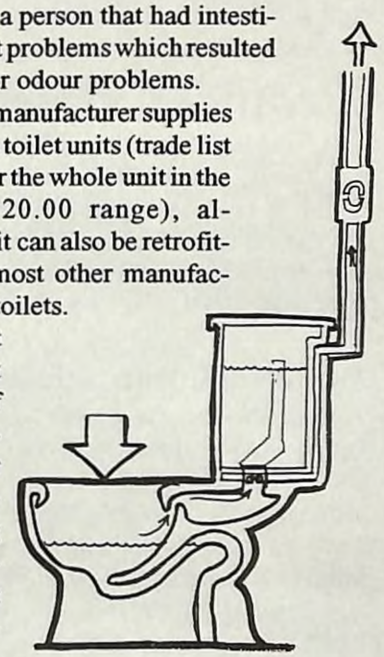
No one appreciates unwanted odours, be it from the garbage, the bathroom or even the kitchen. In North America we've made odour control a fetish - to the point there's a massive chemical industry that makes products to mask smells.

Most of us have encountered moments when we or someone we know had problems leading to much embarrassment and discomfort as bathroom odours wafted through the house. There are a few unfortunate people that have intestinal problems, for whom the problem is not occasional but a regular condition.

It's not socially acceptable to talk about toilet odours or bowel movements. Controlling or removing bathroom odours is important to maintain a clean, healthy and liveable indoor environment. Just masking the odours is not the answer. The common bathroom fan is now a standard fixture - whether it really works or not.

We've recently come across the Ventex odour removing toilet that was developed to provide controlled ventilation to remove odours at their source. Odours are removed directly from the toilet bowl by a small exhaust fan which can be located in the wall or ceiling. The fan draws about 10 cfm through conventional plastic piping. The system uses a single channel to draw air and supply flush water to the bowl through a patented valve that shuts down during the toilet water flush cycle.

The idea for the Ventex odour removing toilet came about as a result of a desire to help a person that had intestinal tract problems which resulted in major odour problems.



The manufacturer supplies his own toilet units (trade list price for the whole unit in the $100-120.00 range), although it can also be retrofitted to most other manufacturer's toilets. At least one of the major plumbing equipment manufacturers is considering picking up an option to market the system with their product lines.

The toilets have attracted considerable interest. Several multi-family residential projects in the Greater Vancouver area now under construction have opted to use these toilets. The B.C. Advanced house will be installing the system in the toilet in the powder room that will be available for visitor use.

For information:
Henry Martens International
102 - 31234 Wheel Ave.
Abbotsford, B.C. V2S 1M3
Tel: (604) 852-2245
Fax: (604) 852-3350

The Technical Research Committee (TRC) is the industry's forum for the exchange of information on research and development in the housing sector. Anyone with a problem, technical question of suggestions for areas that need to be investigated is encouraged to contact their local Home Builder's Association technical committee or the TRC directly.
Canadian Home Builders Association,
200 Elgin St. Suite 502,
Ottawa, Ont. K2P 1L5
Tel: (613) 230-3060
Fax: (613) 232-8214

EMR/CANMET NEWS

The Canada Centre for Mineral and Energy Technology (CANMET) is the research and development arm of Energy, Mines and Resources. EMR/CANMET's Buildings Group works with industry to develop and commercialize the technologies to make Canadian houses more energy efficient. With the support of the Buildings Group, Solplan Review presents this information on some current CANMET projects. For more information contact: Energy Efficiency Division, EMR/CANMET, 580 Booth St., Ottawa, K1A 0E4.

Advanced Houses Open

Two of the ten Advanced Houses under construction across the country officially opened their doors to the public in September. Public response was overwhelming. The Manitoba Advanced House, which opened on September 11, and the Saskatchewan Advanced House, (opened September 15), had more than eleven hundred people attend the opening weekend festivities at each house.

Manitoba Advanced House

The official opening was marked by the planting of a tree to symbolize the home's dedication to a healthy indoor and outdoor environment. The ceremony was presided over by the Hon. Jake Epp, Minister of Energy Mines & Resources and included talks by Jim Earnst, Manitoba Minister of Housing, William Norrie, Mayor of Winnipeg, Gerry Roehr of the Canadian Home Builders' Association and Derick Thorsteinson of the Manitoba Home Builders' Association.

The ceremonies included a special industry preview for anyone connected with the construction of the House, including tradespeople, suppliers and sponsors. Don Glays, project leader, was particularly pleased with the response on the part of the building community to the completed project. "The new technologies were well received - and not necessarily just the high-tech ones," said Glays. "Many of the low-tech improvements, like the return air vents in the closets and the crushed-glass drainage pad, drew rave reviews. Most of the builders I spoke to see this house as the future of the industry".

The House will be open to the public on weekends, and for pre-arranged tours during the week until the end of 1993. The House will then be sold and monitored for one year.

Saskatchewan Advanced House

An impressive, well-attended ceremony took place in Saskatoon for the opening of the Saskatchewan Advanced House. The ceremony, attended by Henry Dayday, Mayor of Saskatoon, MLA Pat Lorje, and Frank Campbell, Director of CANMET as well as representatives from Sask Power, Sask Energy and other industry organizations, included throwing a switch to turn on the photovoltaic system, talks from representatives of the many organizations that had supported the project since its beginning, and a special tour and dinner for those connected with the project.

Inside, working models of many of the prototypes installed in the house were set up so that people touring the house could see how the technology actually functions. "For most of the people involved with the house, especially the trades, it was the first time they had seen their piece of the project in action. They came to understand what the entire project was really all about," said organizer Keith Hanson.

As an ironic testament to the House operating as it was intended, all the windows had to be opened at one point during the ceremonies due to the build-up of heat generated by the large crowd. "The House, after all," said Hanson, "was designed to keep heat in."

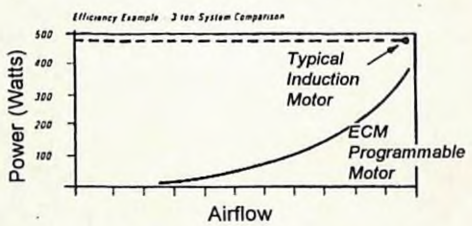
Like the Manitoba Advanced House, the Saskatchewan Advanced House will be open to the public until the fall of 1993 - at that point, the house will be sold and monitoring will continue.

GE to be Official Sponsor

Another event took place at the Manitoba Advanced House Opening - the announcement by the Federal Energy Minister, The Hon. Jake Epp, that GE Canada and Camco Inc. (a GE affiliate) have become official suppliers to the Advanced House Program.

Under the terms of the sponsorship GE Canada and Camco will supply a wide range of products for use in the ten Advanced Houses. "GE believes it produces some of the most energy-efficient products on the market today," said Niraj Bhargava, manager of business development for GE Canada. "The Advanced House program is the perfect opportunity to show those products in action".

One of the GE Canada products is an electronically-commutated motor (ECM) that will be used to operate central ventilation fans, in forced air gas fired systems and ground source heat pumps. This computerized motor is able to adjust its speed based on the load it is handling at any given moment. In addition to energy savings the ECMs are up to 20% more energy



efficient than standard induction motors. The motor will help control peak electrical consumption - one of the technical requirements of the Advanced House program.

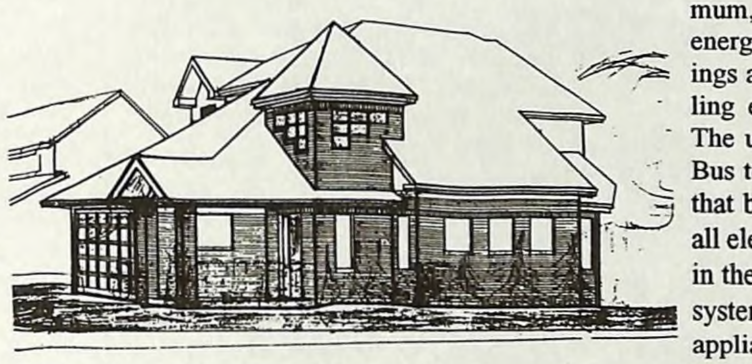
Camco Inc. will be supplying all of the major appliances, including a recently released refrigerator with an Energuide rating of 61 kWh per month - one of the most energy-efficient products in this class available in Canada.

The NEAT Home

The NEAT Home is a two-storey, 1800 sq .ft. home in Hamilton, Ontario. "NEAT" stands for Novel Environmental Technology. Many of the technological prototypes and construction innovations in the house reflect a concern for environmental issues. Construction began in August and the house is due to be completed in February of 1993.

Foundation Systems

The house features three different foundation systems: Sparfil insulated blocks; an innovative "sandwich wall"; and the innovative use of an above-ground wall system used below-ground. The three systems will be monitored for thermal performance.



The sandwich wall is made of a 3" insulation layer (type 4 polystyrene) and a 2" drainage layer (baseclad), sandwiched between two layers of poured-in-place concrete. The inner layer of concrete (6") supports the house while the outer layer (3") supports a brick veneer. The system provides full-height insulation, eliminates thermal bridging at the header and simplifies the finishing of the interior and the exterior. As well, the cast-in-place system gives the system a 'conventional' nature that requires little change to sub-trade sequencing or operating procedure.

The Stelwire 3D Wall is made of a 4" layer of non-CFC polystyrene insulation embedded in a wire mesh framework. Pre-fabricated wall panels are delivered to the site; once in place, a spray applied concrete (shotcrete) is applied to both sides forming the finished wall. The shotcrete provides rigidity, with the wire mesh acting as reinforcing. The finished wall has high strength, a high thermal resistance and low moisture absorption characteristics.

Wall System

The above-grade wall system is a truss type using 2"x 3" chords on the interior and exterior, and supported by a metal bracket. On the ground floor the wall cavity will be filled with a prototype pour-in-place insulation developed specifically for this project. The new insulation flows easily around the brackets and does not build up the kinds of pressures that can force drywall off. On the second floor, the cavity will be filled with a standard fiberglas batt insulation. Both insulation types will be monitored for thermal performance.

This truss wall system is resource-efficient (uses smaller amounts of lumber) and provides a significant reduction in heat loss by reducing thermal bridging.

Integrated Mechanical System

The house will feature a prototype integrated system for space heating, cooling and ventilation. The system was custom-designed for this project with strict attention paid to the optimization of energy use. Key features of the system include: (i) a zoned ventilation system, in which supply and exhaust air are increased or decreased depending on zone needs; (ii) free-air cooling where, depending on temperature and humidity, return air is circulated to the outside and fresh air is brought in as replacement; and (iii) an evaporative cooling system using recirculated rainwater.

The cooling system also meets many Advanced house environmental requirements as the system is CFC free and makes innovative use of a limited resource - fresh water.

Home Automation

With energy saving from envelope improvements reaching their maximum, the next big step in overall energy - and environmental - savings are to be gained by controlling energy consuming devices. The use of Consumer Electronic Bus technology (CEBus) will do that by integrating the control of all electric and electronic devices in the home. Through the CEBus system each of the home's major appliances and mechanical systems will be able to communicate what it is doing with other energy users in the house to use energy in an efficient, effective manner. For example, CEBus will be able to calculate the cooling potential available through free-air cooling and make the necessary adjustments in the operation of the mechanical cooling system.

In addition, the CEBus provides a "gateway" for utility remote control of power consumption. The electrical utility will be able to exercise some control over home energy use in order to manage the utility's peak load. Under this kind of arrangement consumers might qualify for a lower power rate during peak load times. More importantly, given that peak load electricity (in Ontario) is generated with the least efficient infrastructure (i.e. coal), the system offers major environmental benefits.

Technical Research Committee News

Canadian Home Builders' Association

Contaminated and Toxic Soils

With increasing redevelopment taking place in urban and suburban areas, there is an increased use of land that has been used for industrial purposes or as land fills. However, there is little information about what preparation is necessary or advisable before development and construction can take place.

The TRC is working with CMHC to gather information so that inner-city land can be appropriately redeveloped. Projects are underway to gather information on methods to evaluate lands, to develop a guide for municipalities on how to deal with such properties, survey remedial measures, focusing on more long term monitoring, and how to conduct an environmental audit before a house is built on it.

Those with an interest in this area can contact TRC or Don Johnston at CMHC directly.

Builder's Guide to Environmental Products

There is a lot of interest in environmentally sensitive building, but where do you go to find information on products and systems that are available? How do you assess manufacturer's claims? The TRC is committed to the production of such a guide for use by builders in Canada. Stay tuned for further developments.

Lead Research

Lead was used in paints until very recently. It can be toxic, especially for young children, so care has to be taken when working on older buildings containing lead based paints. CMHC has prepared a couple of consumer flyers outlining hazards in lead paints.

CMHC will also be releasing a report on the use of paint strippers (the Health and Welfare Canada recommended way of removing paint from older houses). The report looks at what hazards are involved, how to protect yourself, and what type of ventilation is required.

Saskatchewan Research Council looked at how to clean up lead dust after a major renovation. For cleaning bare floors, any appliances (from a broom to a vacuum cleaner) will clean up to 99% of the lead dust. On a rug a vacuum with a power head clean up to 95% or more.

A 500 house study in St. John, New Brunswick will look at the lead levels in the water and in the occupants of the houses. In 100 of these houses, tests will be done for lead in the dust, paint and the soil in the houses.

Monitoring of Forced air Heating Systems

The Saskatchewan Research Council did measurements on forced air systems. It was found that the return air circuit was getting 80% of its airflow through leaks in the ducts and not through the registers where it was designed to come in. This should prompt some thinking about how systems are laid out and installed.

CGRI Testing

What happens to mid-efficiency gas appliances (hot water heaters and furnaces) that are side wall vented when the house is depressurized? There is little information on how this type of equipment will perform under sustained negative pressures. Will they spill combustion products into the house? Tighter building envelopes, and increased use of large exhaust appliances (such as strong range hoods or downdraft cooktops), means it is easy to induce substantial negative pressures in a house.

Tests are presently being done by the Canadian gas Research Institute (CGRI) to develop a test method that will be used to determine allowable depressurization levels that can be applied to this type of equipment.

You asked us

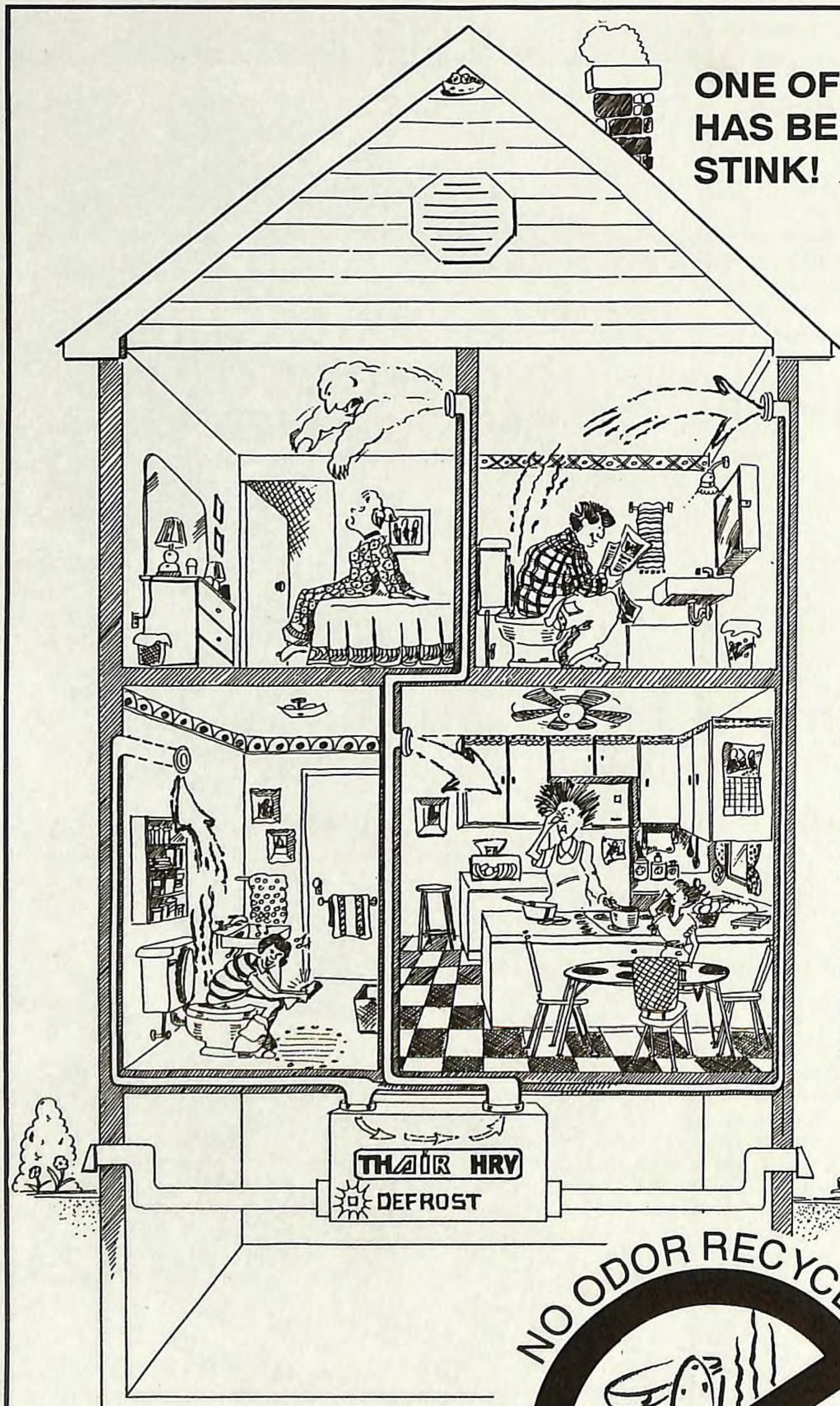
I've heard claims that R-2000 houses are healthier. Is there evidence to support those claims?

The average market house is substantially tighter than it was only a few years ago - this was measured by air tests of many merchant market houses (not R-2000 or specially built energy efficient houses) in all parts of Canada. Houses are tighter because of an increased use of panelized materials and a desire on the part of home owners for comfort and avoidance of drafts. Tighter homes, if they are not built with proper attention to materials selection (avoiding those that off-gas) and ventilation, will trap pollutants inside the house.

The pollutants in the house are those generated by people and their activities, clothing and furnishings brought into the house, and construction materials. The builder can only deal with the building materials, but the house and its systems have to allow for common occupancy patterns. In recent years there has been a lot of research about indoor air quality in new and existing buildings. Indoor air quality (humidity and other gases) are considered as the best indicator of the healthiness of the environment.

In the early 1980's, when there was a major growth in modular home construction, it was discovered that indoor conditions in many of these houses were very bad. This was largely due to the use of large quantities of low cost, panelized materials and the better quality control inherent in factory construction that produced very tight buildings, but without adequate ventilation.

Many detailed monitoring studies have been done on R-2000 homes (along with 'conventional' control houses) over the past several years - undertaken by or for Energy Mines & Resources, R-2000, CHMC, Saskatchewan Research Council, and Health & Welfare Canada. They have consistently shown that the indoor air quality inside of R-2000 houses is better than in conventional housing.



ONE OF OUR COMPETITORS HAS BEEN MAKING A BIG STINK! *AND HERE'S HOW ...*

It's a matter of principle. We, the people who make LIFEBREATH™ HRVs will never make an HRV intended to recycle bathroom exhaust air. No sir, never, no way!

Maybe that's why our LIFEBREATH™ HRVs easily outsell all others in Canada. We design them right and service the heck out of our customers.

The sweet smell of success is something you just can't buy!

One of our competitor's HRVs actually recycle bathroom air throughout the house during their defrost cycle (about -5°C and colder) when installed as above.

NUTECH ENERGY SYSTEMS INC.
511 McCormick Blvd.
London, Ontario. N5W 4C8
Ph 519-457-1904
Fax 519-457-1676